

# **WILD WEATHER**

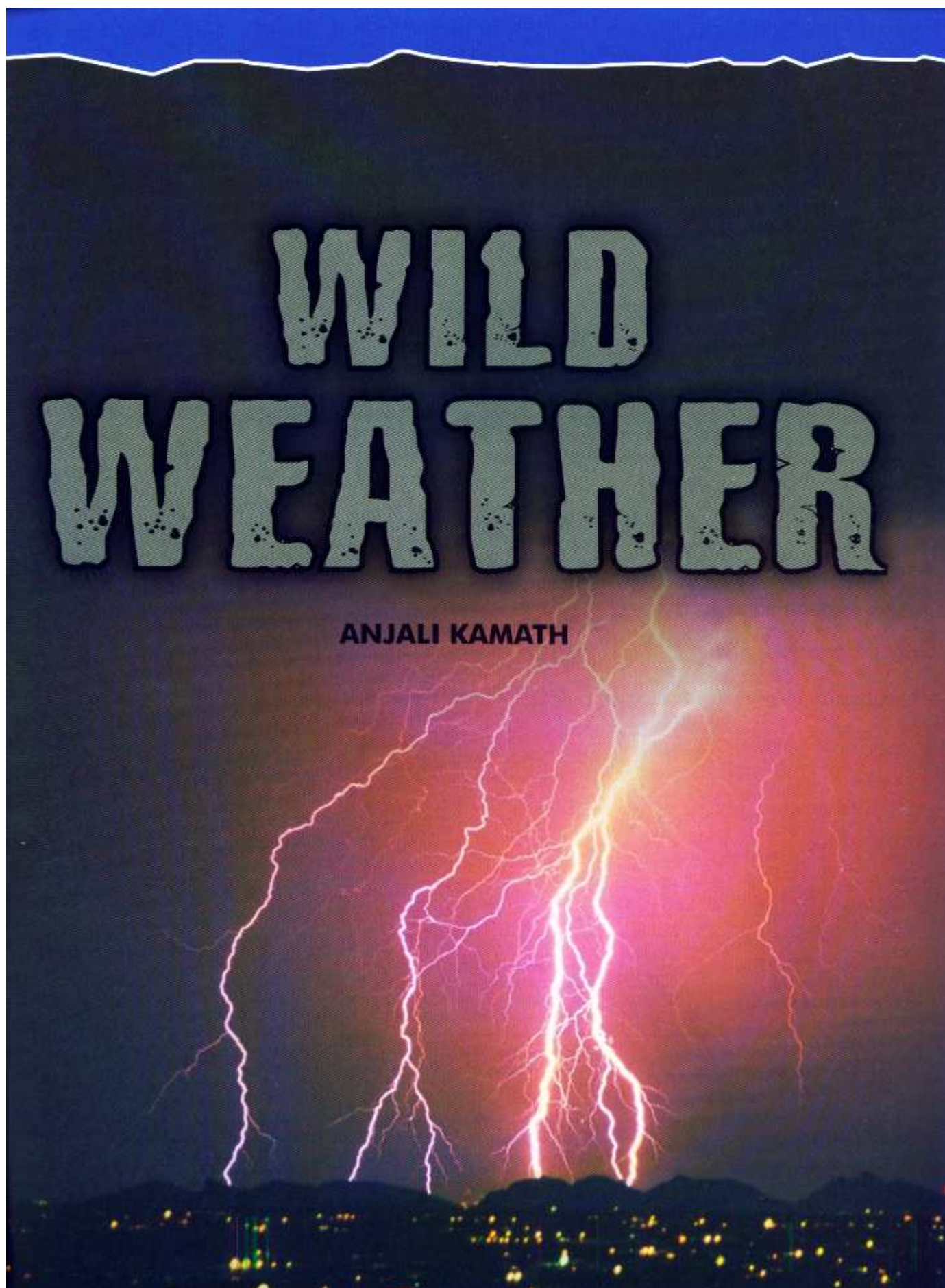


**Nature's unpredictable agents**



# WILD WEATHER

ANJALI KAMATH







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**Editor** Aziel Karthak

**Art Director** Rahul Dhiman

**Senior Designers** Cheena Yadav and Ranjan Singh Garsa

**Art Editor** Tia Meren Long

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# What Is Weather?

So often we find ourselves talking about how sunny, windy or rainy a day is. Every time we do that, we are talking about weather. The atmosphere of Earth at any given time is weather. Weather can be hot, cold, windy or calm.

▲ The weather forecasts are not always 100% accurate. This is because weather changes all the time. For instance, if it's predicted that there will be rainfall, there might be times when it will not happen.

## Climate

Weather is different from climate. Weather is the condition of air over a short period. That period could be anything from an hour to a few days. Climate, on the other hand, is the weather condition of a place over a long time, which could be anything from 10 to 30 years.

## Influence of weather

The different types of crops and fruits we eat need different weather conditions to grow. Plants require both rainfall and sunshine to grow. However, rough and stormy weather can also ruin crops.



## Different clothes for different weather

Weather influences the way we dress. When it's cold, we wear warm, woollen clothes. When it's hot we wear cotton clothes. In fact, weather has been known to affect a person's behaviour as well. Haven't we found ourselves in a gloomy mood during cloudy days and chirpy when the Sun is shining?

## The ugly side of weather

Weather is more than just hot or cold. Weather can be very destructive as well. There are several kinds of extreme weather conditions that can actually take human lives. Some of the most common extreme weather conditions are tornadoes, hurricanes and blizzards.

*Understanding the weather will help us take necessary action to protect ourselves during any weather-related events. Like a cloudless day would mean a good weather for the day.*



# Sun, Wind And Clouds

**Weather is influenced by many conditions, like wind, temperature and clouds.**

**Most weather changes take place in the troposphere, which is the lowest layer of the Earth's atmosphere. In all weather changes, the Sun has an important part to play.**

## The Sun's influence

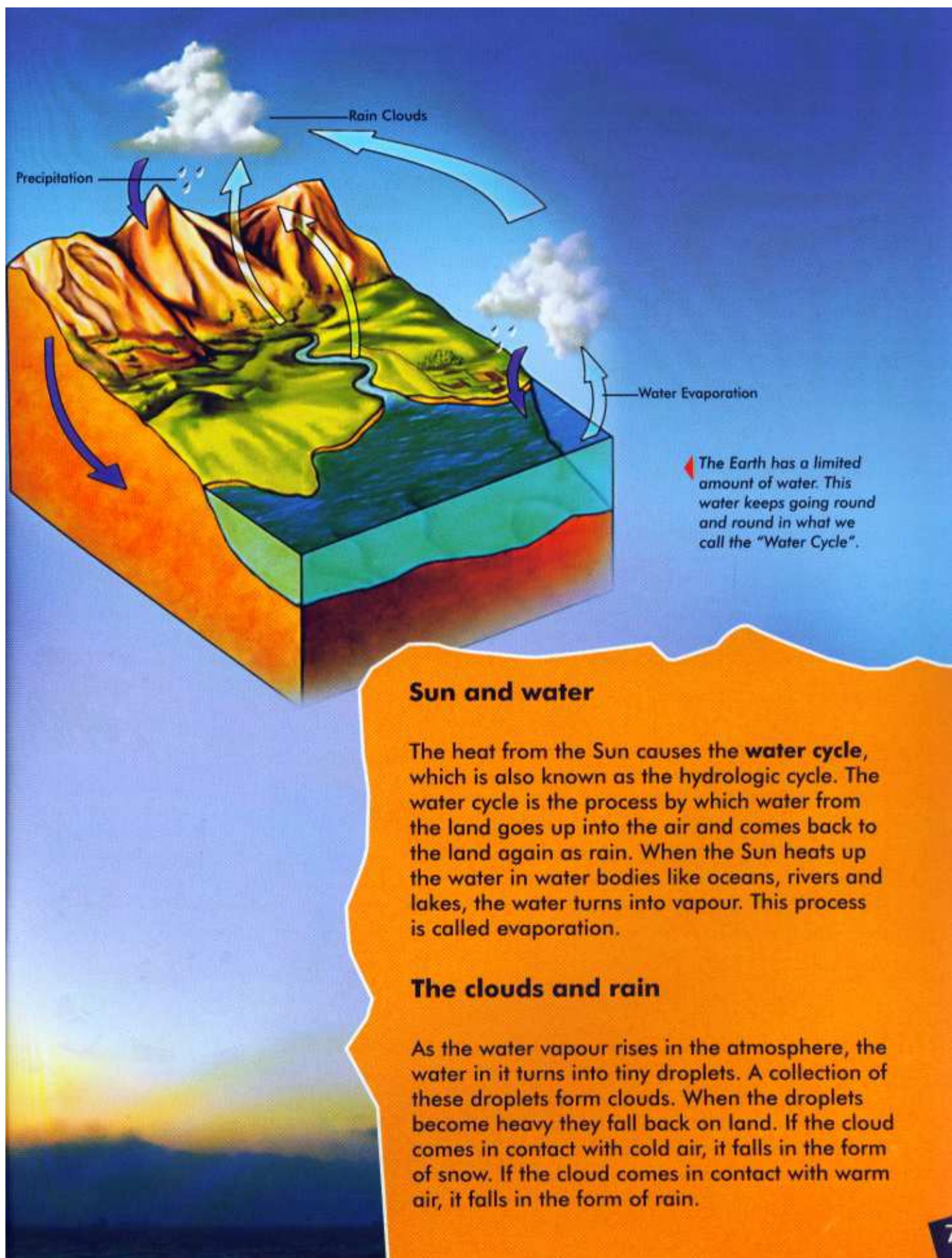
When the Sun's rays fall on the Earth, not all parts get equal heat. The solar energy affects some parts of our planet more than others. This difference leads to changes in wind, temperature and air pressure. When these changes take place, weather is affected.

## Hot and cold air

Cold air is heavier than hot air. When the heat from the Sun warms the air on Earth, it rises up. The heavier cold air quickly takes its place. This causes different types of wind. The wind could be nice and breeze-like or it could be a raging **storm**.

Strong winds are the most common means of destruction. They can uproot trees, knock over buildings and homes, fling deadly debris around, and flip cars.





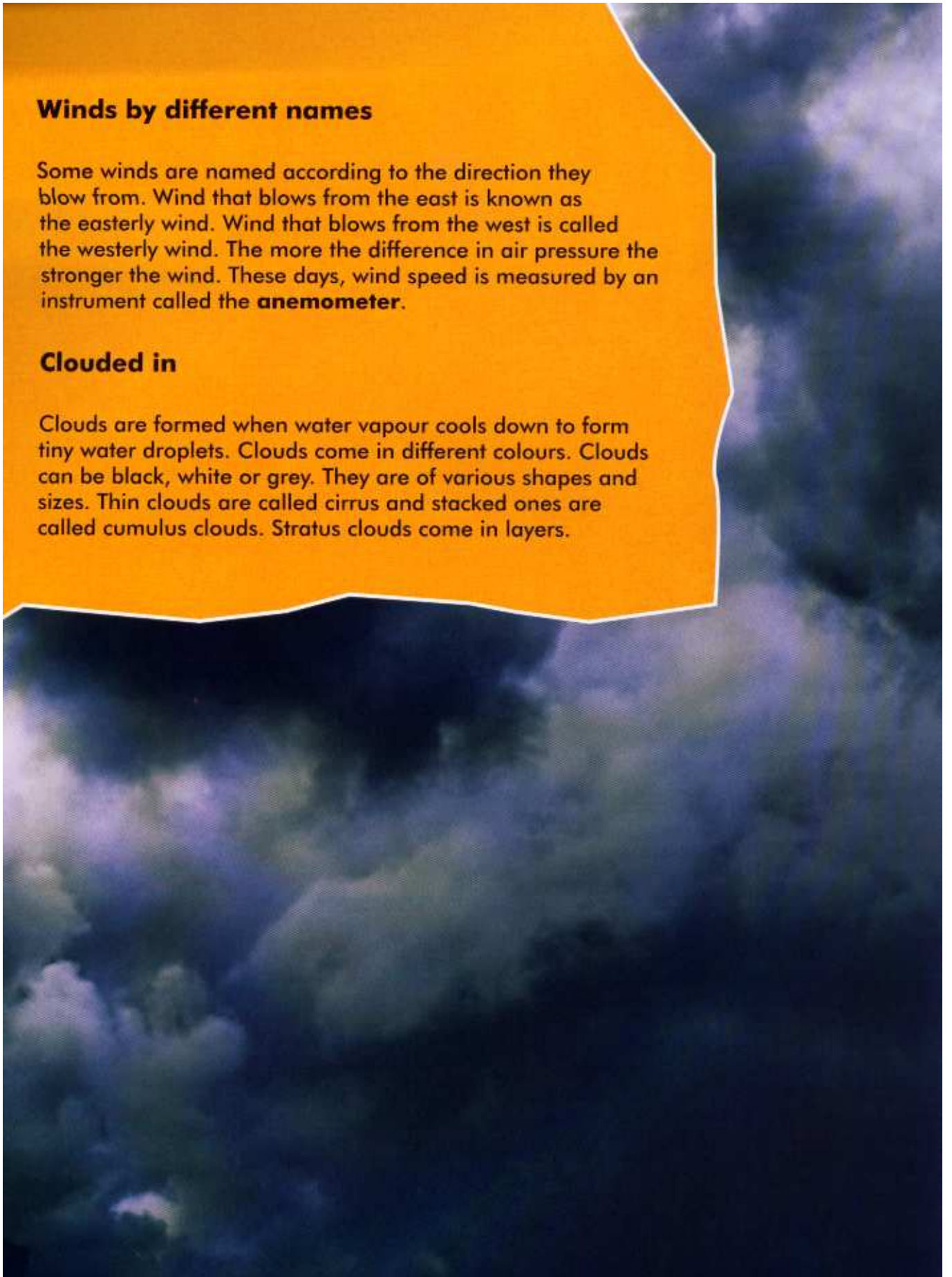


## Winds by different names


Some winds are named according to the direction they blow from. Wind that blows from the east is known as the easterly wind. Wind that blows from the west is called the westerly wind. The more the difference in air pressure the stronger the wind. These days, wind speed is measured by an instrument called the **anemometer**.

## Clouded in

Clouds are formed when water vapour cools down to form tiny water droplets. Clouds come in different colours. Clouds can be black, white or grey. They are of various shapes and sizes. Thin clouds are called cirrus and stacked ones are called cumulus clouds. Stratus clouds come in layers.







*The heaviest rain falls  
from the deepest,  
darkest clouds.*

## **Rain clouds**

It is wrong to say that all clouds bring rain. In fact, there are just two major types of rain clouds: nimbostratus clouds and cumulonimbus clouds. The rain we commonly get during summer and winter months is the work of nimbostratus clouds. Cumulonimbus clouds are responsible for all the bad disasters caused by rain. They bring hail, tornadoes and flash floods.



# Seasons And Climates

**There are four types of seasons that we experience in a year – spring, summer, autumn and winter. All seasons have different weather conditions. The position of the Earth as it revolves around the Sun influences its seasons.**



## Changing seasons

Days are warm and pleasant during the spring. Summer follows spring. Here, the days and nights are hotter. In autumn the days become more pleasant and cool, ultimately leading to winter – the coldest season.

## Winter and summer at the same time

When countries in the Northern hemisphere experience summer, countries in the Southern hemisphere experience winter. This is because when the Earth revolves around the Sun, one half of the Earth gets the majority of the Sun's heat while the other half does not.

▲ The leaves on trees change colour with the seasons. They are the brightest green in summer, rust or orange in autumn, and bare or with few leaves in winter.



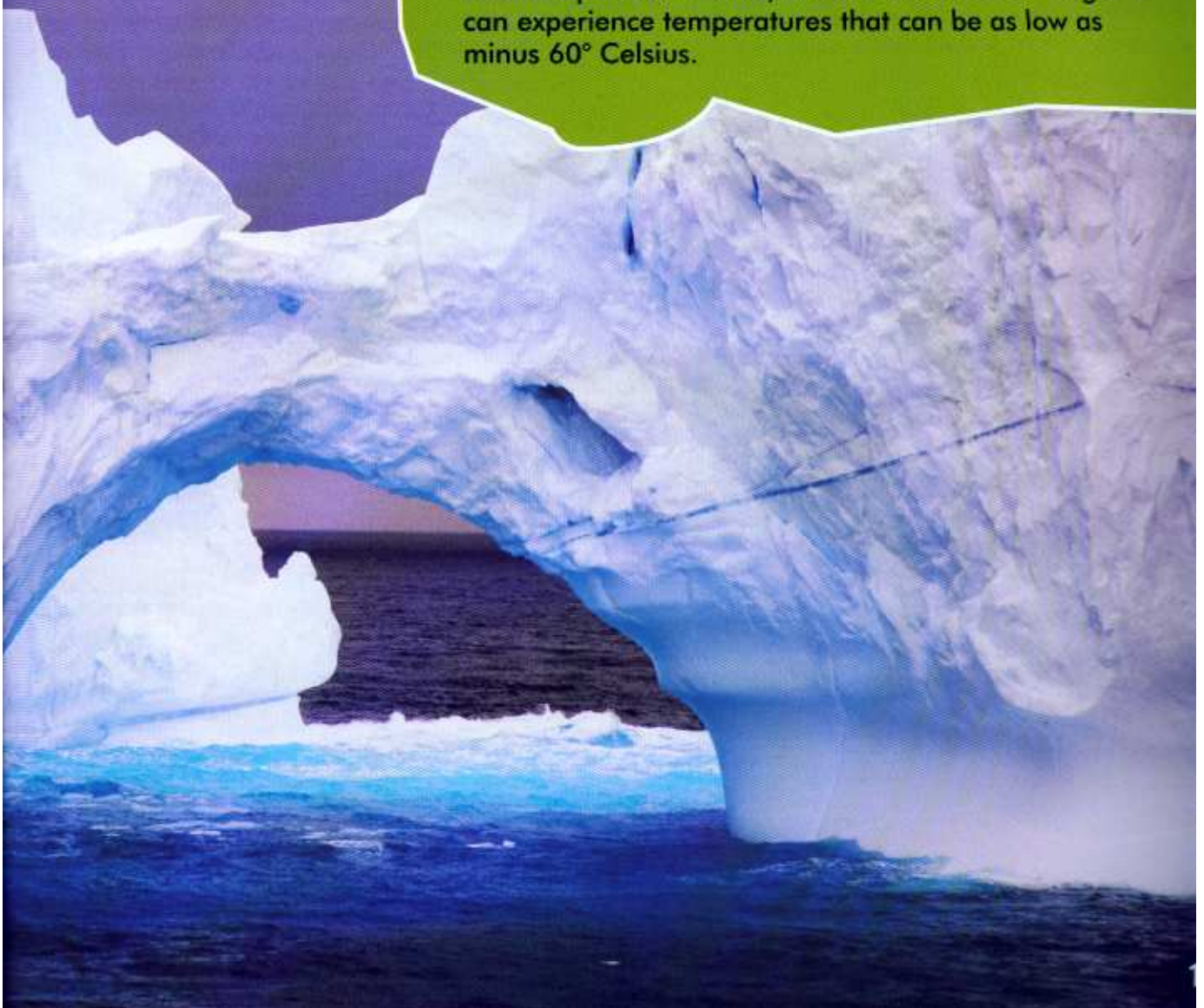
## Tropical and Polar

In the regions close to the Equator, there is very little change in temperature throughout the year. The only difference is the varying amount of rainfall. These regions have a wet and a dry season. The Polar regions, on the other hand, experience light and dark seasons. In the summer, there is no night. In the winter, there is no day.

## Extreme weather

Temperatures in desert regions during the summers can exceed upto  $50^{\circ}$  Celsius, while winters in Polar regions can experience temperatures that can be as low as minus  $60^{\circ}$  Celsius.

*In the Polar regions,  
during the winter the Sun  
never rises and during the  
summer the Sun never sets.*





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## Factors influencing climate

As the Earth tilts on its axis, some regions get more light from the Sun than others. The Polar regions, for example, have long periods of no sunlight in winter and 24-hour sunlight during summer. Also, climatic conditions become colder when altitude increases. Then there is the topography factor. Places surrounded by mountains are drier than others because the mountains act as barriers to the movement of air.

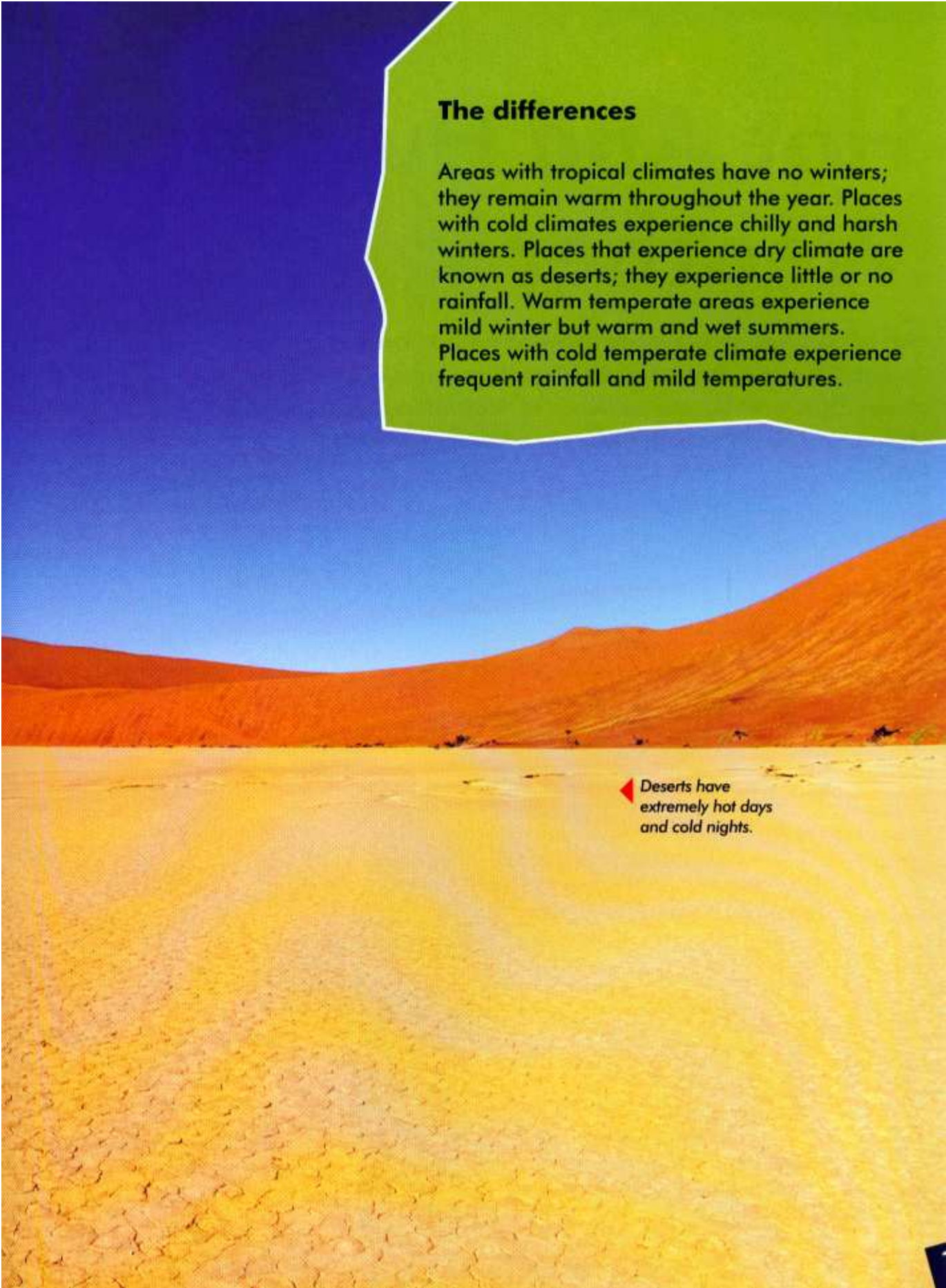
## The five climatic groups

World climate can be divided into five broad categories on the basis of the annual and monthly averages of temperature and **precipitation**. They are cold, cold temperate, warm temperate, dry and tropical.



## The differences

Areas with tropical climates have no winters; they remain warm throughout the year. Places with cold climates experience chilly and harsh winters. Places that experience dry climate are known as deserts; they experience little or no rainfall. Warm temperate areas experience mild winter but warm and wet summers. Places with cold temperate climate experience frequent rainfall and mild temperatures.



Deserts have extremely hot days and cold nights.



# Hot And Humid Weather

All of us have experienced sweat on our bodies at some point. This is because of the humidity that is acting on our body. Hot and humid weather is normal in many parts of the world. But it can be life-threatening as well.

## Humidity

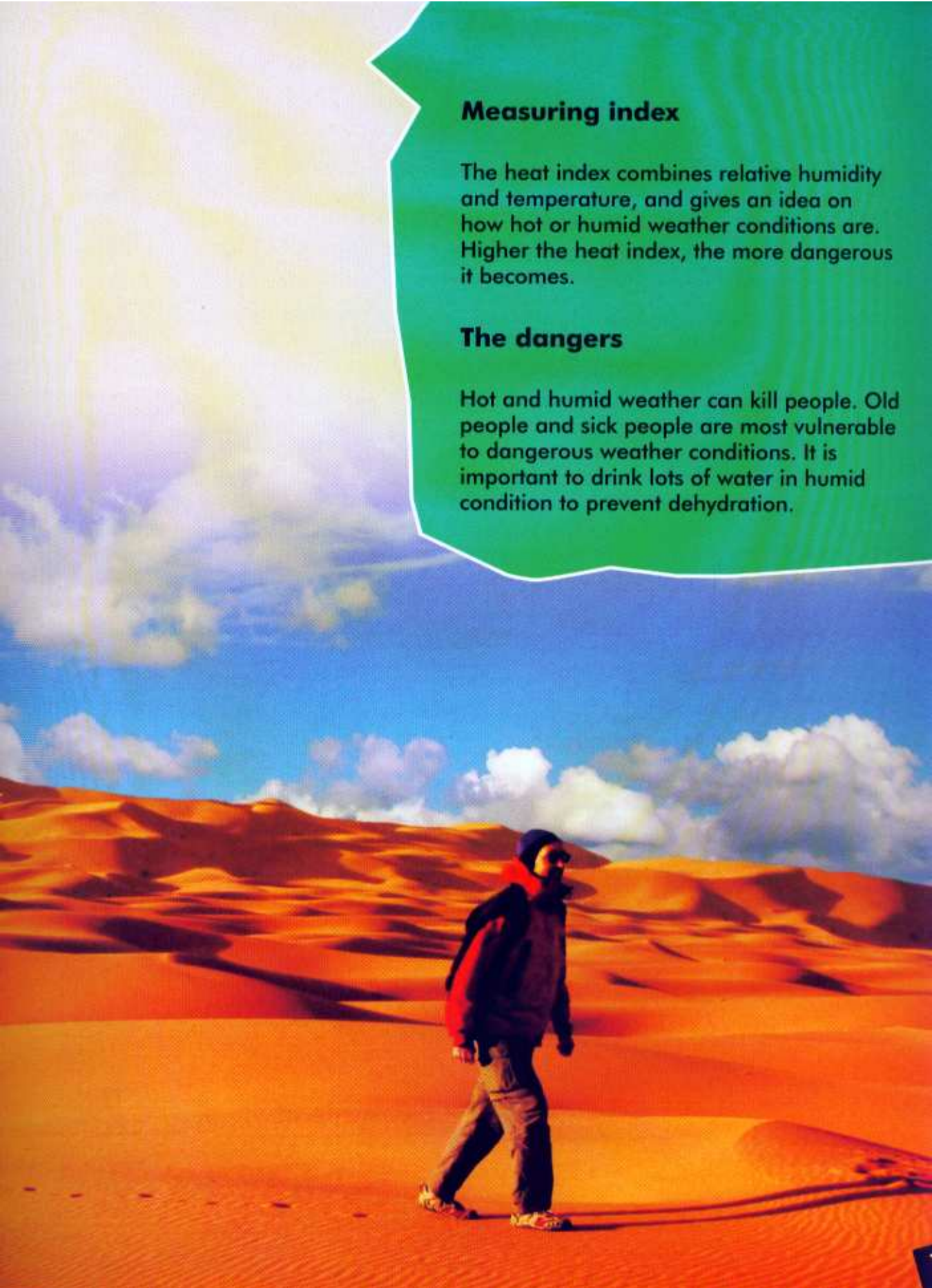
**Humidity** is the amount of water vapour in the Earth's atmosphere. Humidity is higher when the amount of moisture is high. Temperature plays a big role in deciding how much water vapour air can hold. Warm areas have more moisture than cooler areas.

## Relative humidity

Air can hold only a certain amount of moisture before it rains. The amount of moisture in the atmosphere is also called relative humidity. The maximum amount of moisture air can hold is 100 percent. In desert areas, the relative humidity can be as low as 20 percent.

▲ Desert temperatures during the day can reach 55°C (130°F) in the shade. However, temperatures during the night can drop to near freezing because of very low humidity.



A person wearing a dark jacket and a red backpack is walking across a vast, orange-colored desert landscape. The sun is high in the sky, creating a bright, hazy atmosphere. The person is walking towards the right side of the frame, leaving a shadow on the sand. The background shows rolling sand dunes under a blue sky with scattered white clouds.

## Measuring index

The heat index combines relative humidity and temperature, and gives an idea on how hot or humid weather conditions are. Higher the heat index, the more dangerous it becomes.

## The dangers

Hot and humid weather can kill people. Old people and sick people are most vulnerable to dangerous weather conditions. It is important to drink lots of water in humid condition to prevent dehydration.



# Drought Dilemma

**A drought is abnormally dry weather, with no rainfall and extremely high temperatures. Droughts affect crops and vegetation the most. Consequently, it also has a bearing on the economic state of a country.**

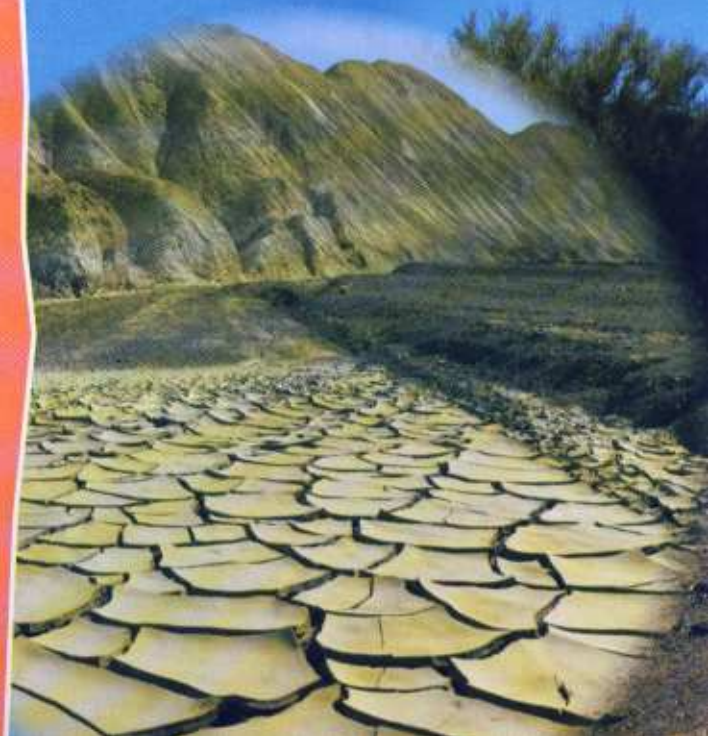
## Too much Sun

**Drought** areas do not have rain clouds. This means that the area gets more sunshine than it should. With the high temperature and low humidity, rainfall becomes impossible. With no or little vegetation, the conditions become even drier.

## Drought dangers

Of all the disasters affecting humankind, drought is number one in the list. Drought has affected the continent of Africa the most. In Africa, during the 1980s, one-fourth of the children below the age of five lost their lives to drought.

*Drought has become a recurrent natural phenomenon of northwestern Bangladesh, i.e. the Barind tract, in recent times.*





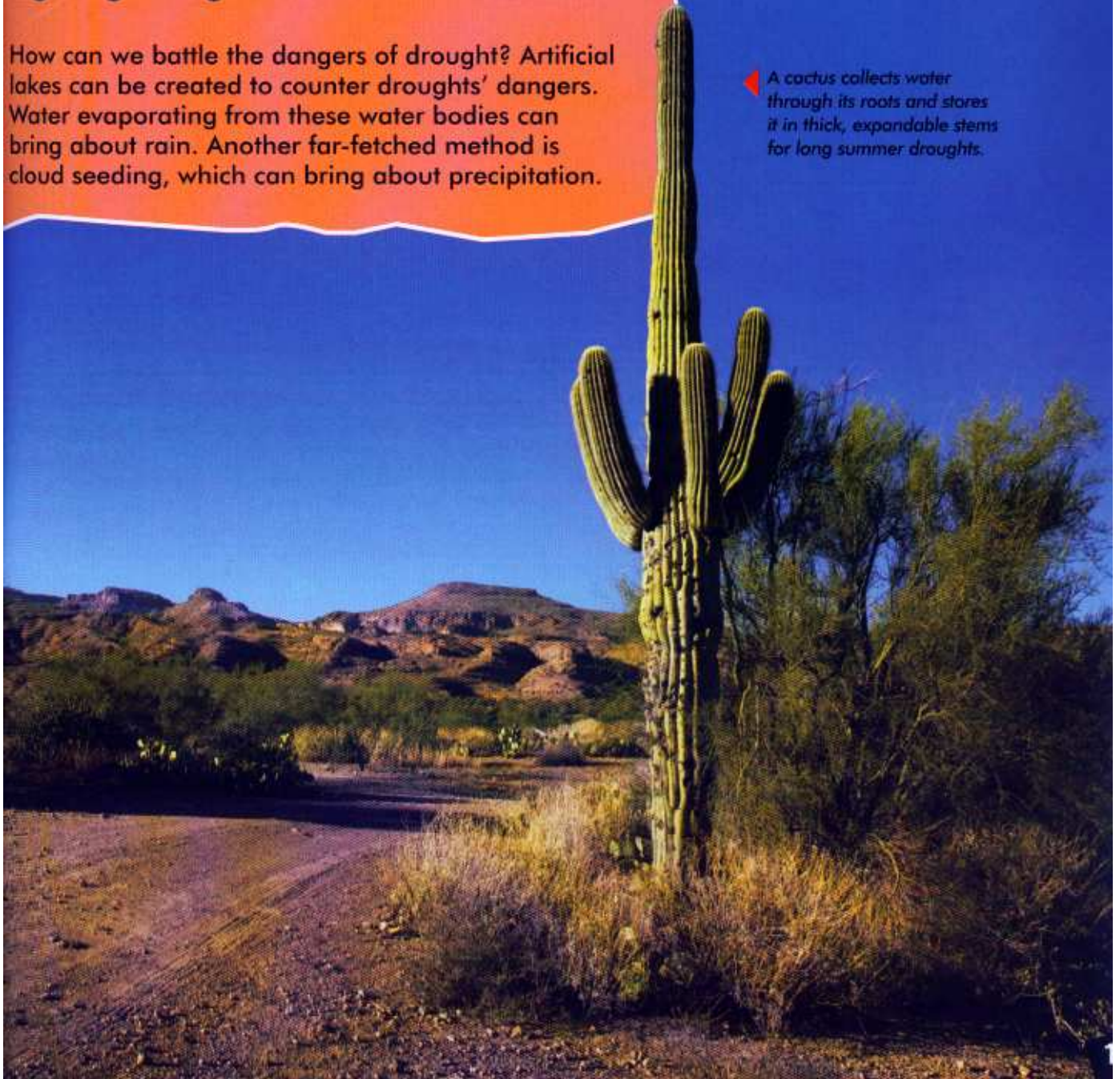
## Factors bringing drought

Areas of sinking air bring about a condition of extremely high pressure. This, in turn, gives birth to dry spells. If this continues for a long period of time it is known as '**blocking high**'. This can cause droughts.

## Fighting drought

How can we battle the dangers of drought? Artificial lakes can be created to counter droughts' dangers. Water evaporating from these water bodies can bring about rain. Another far-fetched method is cloud seeding, which can bring about precipitation.

◀ A cactus collects water through its roots and stores it in thick, expandable stems for long summer droughts.





# Threatening Storms

**Storms are dangerous weather conditions. Thunderstorms are capable of uprooting trees. Cyclones can wipe out towns and take thousands of human lives.**

## Storm forms

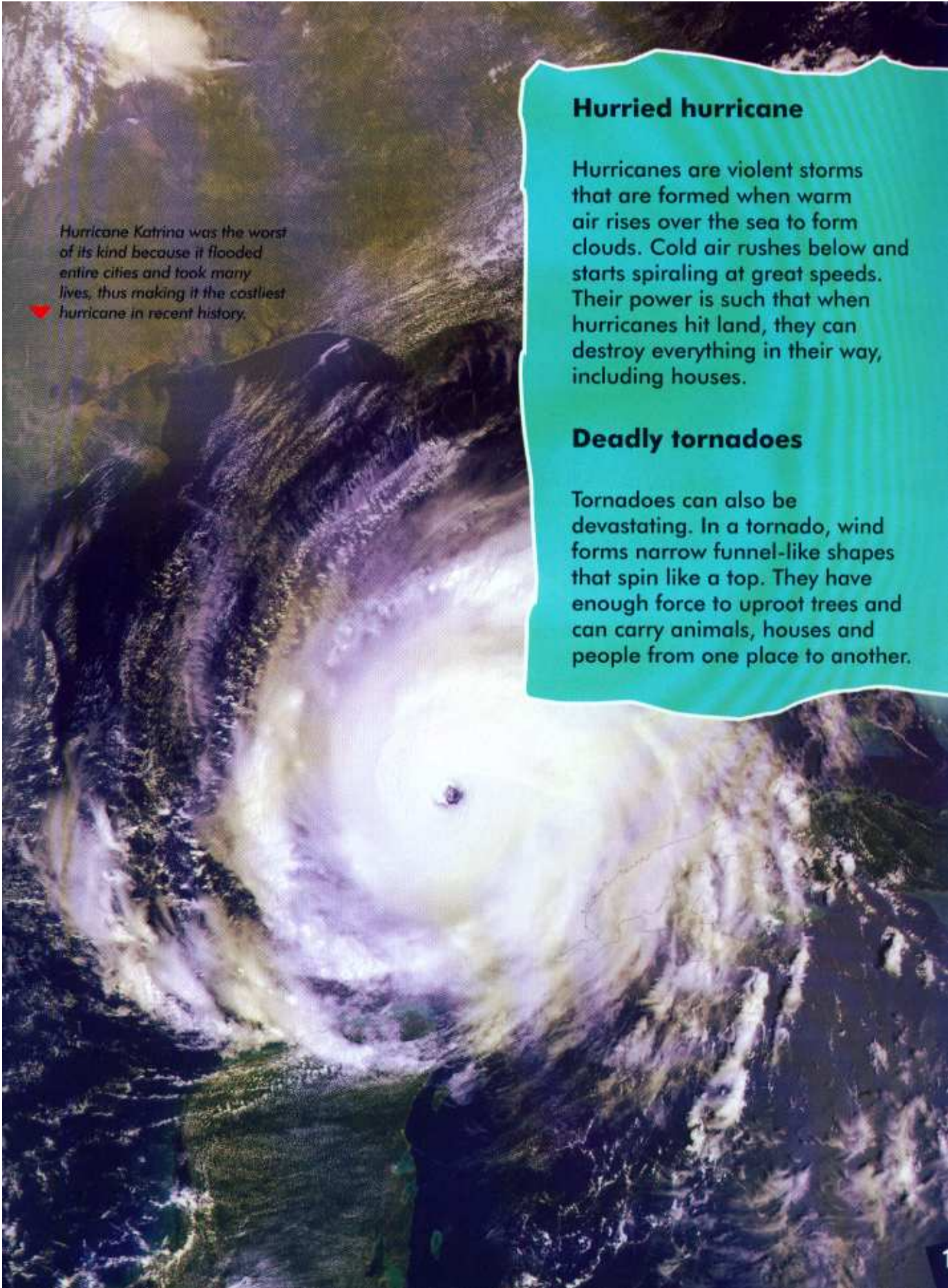
Storms can be of different shapes and sizes. Tornadoes and thunderstorms are smaller and last for a few hours. They usually affect a smaller area of about 25 square kilometres. Hurricanes or cyclones, on the other hand, are bigger and more destructive. They can continue for weeks and can affect areas as large as continents.

## Storm power

Nothing showcases nature's awesome power better than storms. We all have heard how much devastation they can cause. It is impossible to control storms. At best, we can prepare for it. With technology in place, we can now know when a storm is coming.

Although tornadoes have been observed on every continent except Antarctica, most occur in the United States.





Hurricane Katrina was the worst of its kind because it flooded entire cities and took many lives, thus making it the costliest hurricane in recent history.

### **Hurried hurricane**

Hurricanes are violent storms that are formed when warm air rises over the sea to form clouds. Cold air rushes below and starts spiraling at great speeds. Their power is such that when hurricanes hit land, they can destroy everything in their way, including houses.

### **Deadly tornadoes**

Tornadoes can also be devastating. In a tornado, wind forms narrow funnel-like shapes that spin like a top. They have enough force to uproot trees and can carry animals, houses and people from one place to another.




# Lightning And Thunder

**Thunderstorms are violent weather disturbances that don't stay for long. They take place when big volumes of warm, moist air rise higher into the atmosphere.**

## **Thunderstorm development**

As the warm air rises into the cooler upper atmosphere, moisture condenses to form big, dark clouds. When the droplets become too heavy for the cloud to carry, rain occurs. Cool air then hits the Earth with strong winds.





The air in the core of a lightning bolt has been estimated to be as hot as 30,000°C (54,000°F). That happens to be about six times hotter than the surface of the Sun.

## Lightning flash

Thunderstorms are accompanied by lightning. Lightning happens when cool ice crystals in the cloud come in contact with one another. This creates electricity and, consequently, a lightning flash.

## Sound of thunder

The lightning is very hot. When it strikes the air, the air particles vibrate causing the sound of thunder. Lightning can be red and blue in colour as well. However, it is not possible to view these with the naked eye.

## Tall targets

Tall objects like trees or high buildings attract lightning. Therefore, you should avoid taking shelter under trees during lightning. If you are facing a thunderstorm outside, it is best to crouch down.

Tall trees growing alone in open areas; trees with roots in moist soils; or those growing along bodies of water are most likely to be struck by lightning.





# Rain: A Blessing And A Curse


**Rain is necessary because it gives plants and vegetation the much-needed nourishment. It sustains human beings and animals as well. But too much of it can result in deadly floods.**

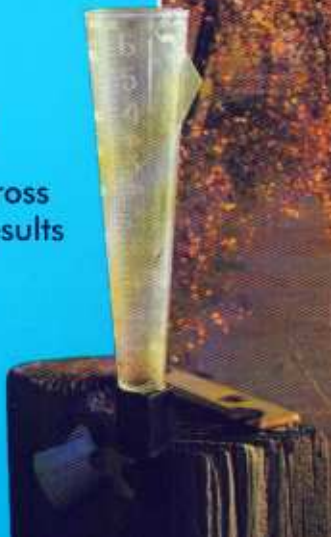
## Raindrops

Rain is formed when water from land evaporates and forms clouds. When the droplets that form clouds become too heavy, they fall down as rain. Raindrops vary in size and the speed with which they fall. The bigger raindrops fall with greater speed. Raindrops are between 0.50-6.40 millimetres in diameter.

## Monsoon wash

Areas near the tropics get seasonal rain that is brought by winds called monsoon. The monsoon blowing across Southern Asia during the summer results in heavy rainfall in the region.

*A rain gauge is an instrument for measuring the quantity of rainfall.* 





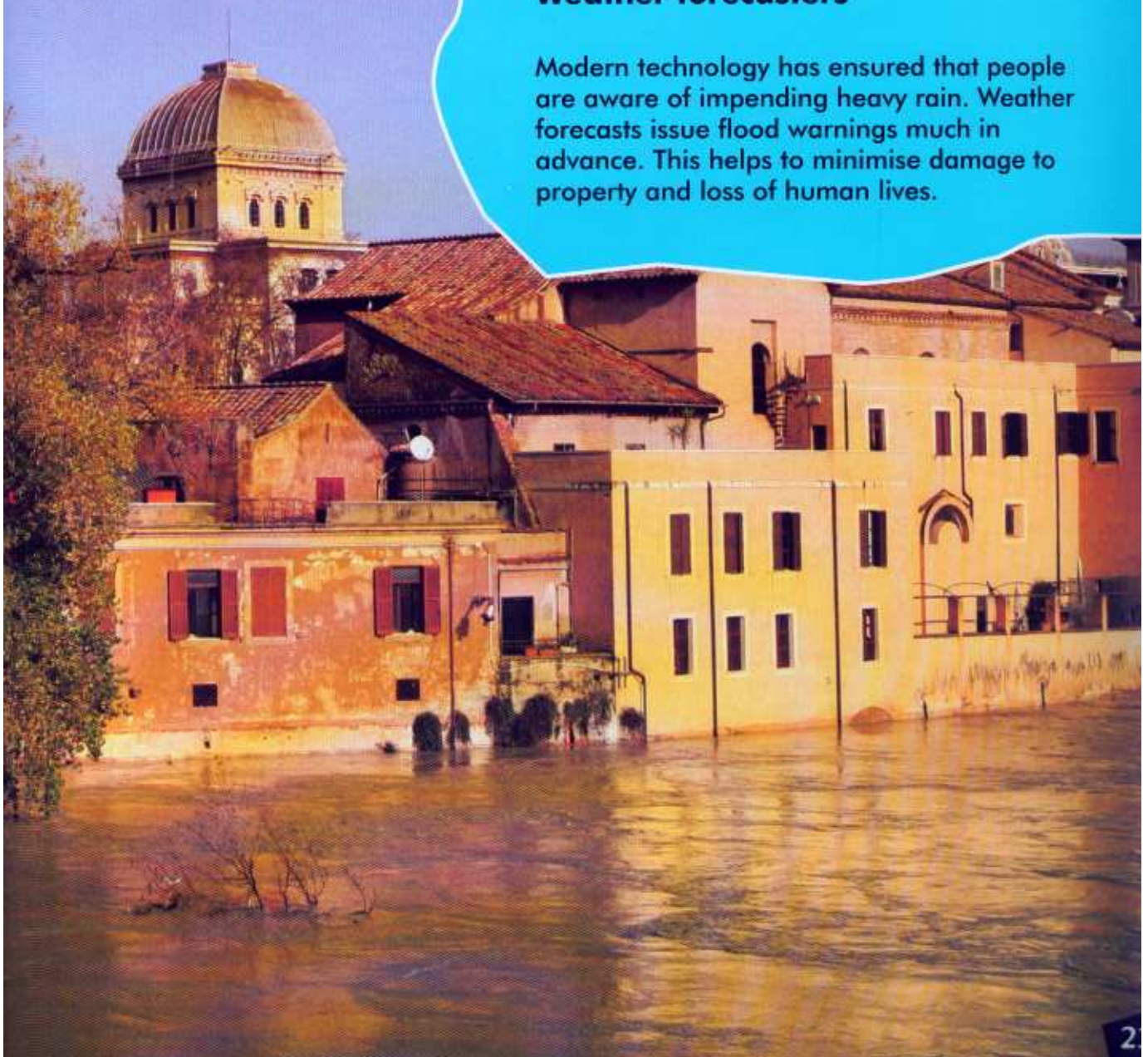
Flash floods move at very fast speeds. They have the power to move boulders, tear out trees, destroy buildings, and destroy bridges. Walls of water can reach heights of 10 to 20 feet and generally carry a huge amount of debris with them.

## Flash flood

When there is too much rainfall, it can get extremely dangerous. It causes flash floods. Sudden and excessive rainfall can cause water in rivers, oceans and lakes to come out of their banks. This may happen over a very short period of time. Flash floods are particularly deadly as they come without much warning.

## Weather forecasters

Modern technology has ensured that people are aware of impending heavy rain. Weather forecasts issue flood warnings much in advance. This helps to minimise damage to property and loss of human lives.





# Dangerous Snow

Do you know that during the Ice Age, the world was covered in snow? While that is long gone, there are still some parts of the world, like Siberia and Antarctica, which experience snow throughout the year.

## Glaciers

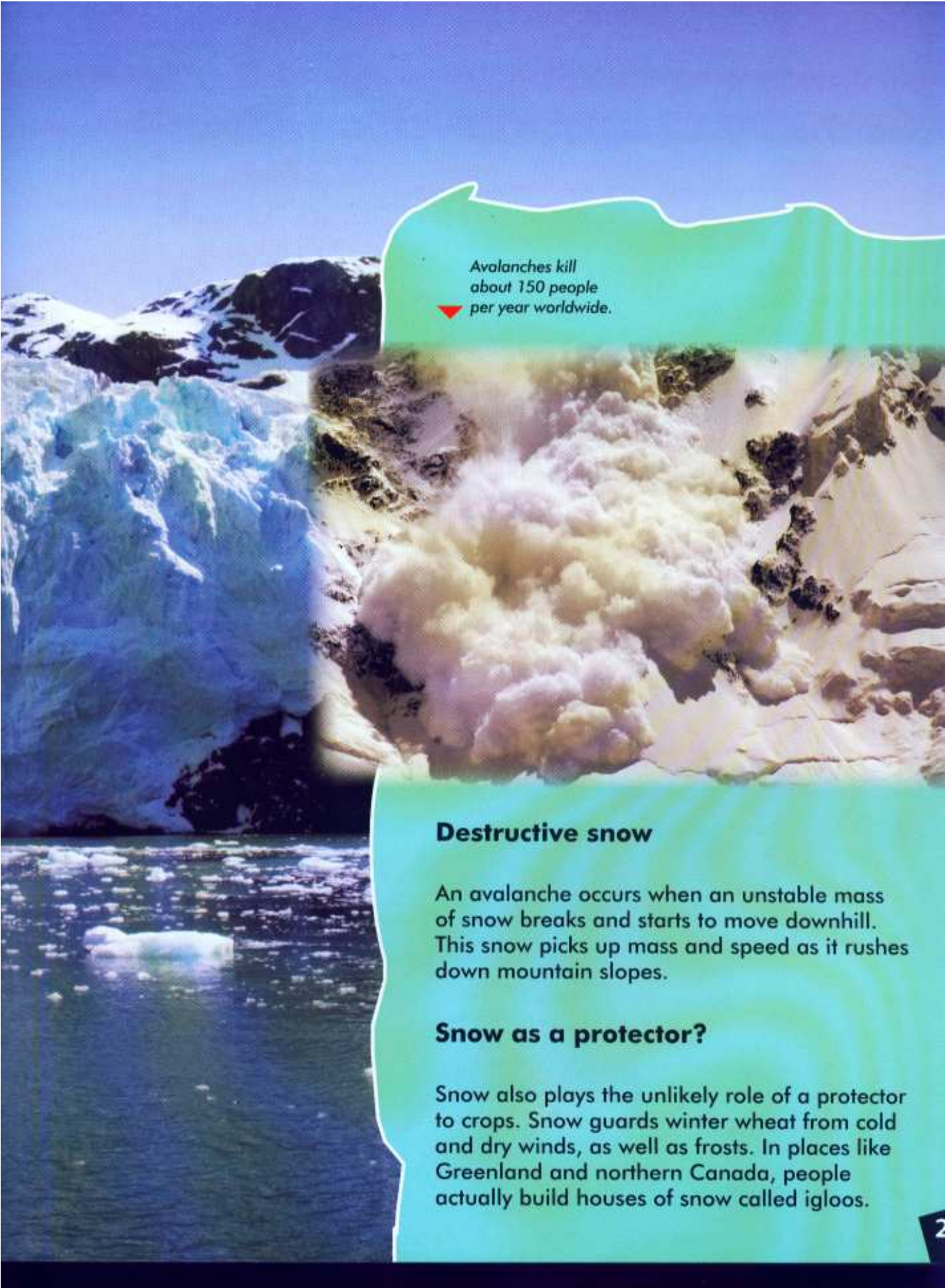
Factors like wind and temperature influence the coating of the snow. If the snow survives the Sun's heat and does not melt over a long period of time, it grows denser and eventually forms **glaciers**.

## Dangerous avalanches

Even the harmless looking snow can be dangerous. The best example is an **avalanche**, which is a moving snow mass that carries ice, rocks and even uprooted trees.

▲ In Peru in 1941, 6,000 people died when a glacial lake suddenly burst open, flooding the town of Huaraz below it.





Avalanches kill  
about 150 people  
per year worldwide.

### **Destructive snow**

An avalanche occurs when an unstable mass of snow breaks and starts to move downhill. This snow picks up mass and speed as it rushes down mountain slopes.

### **Snow as a protector?**

Snow also plays the unlikely role of a protector to crops. Snow guards winter wheat from cold and dry winds, as well as frosts. In places like Greenland and northern Canada, people actually build houses of snow called igloos.

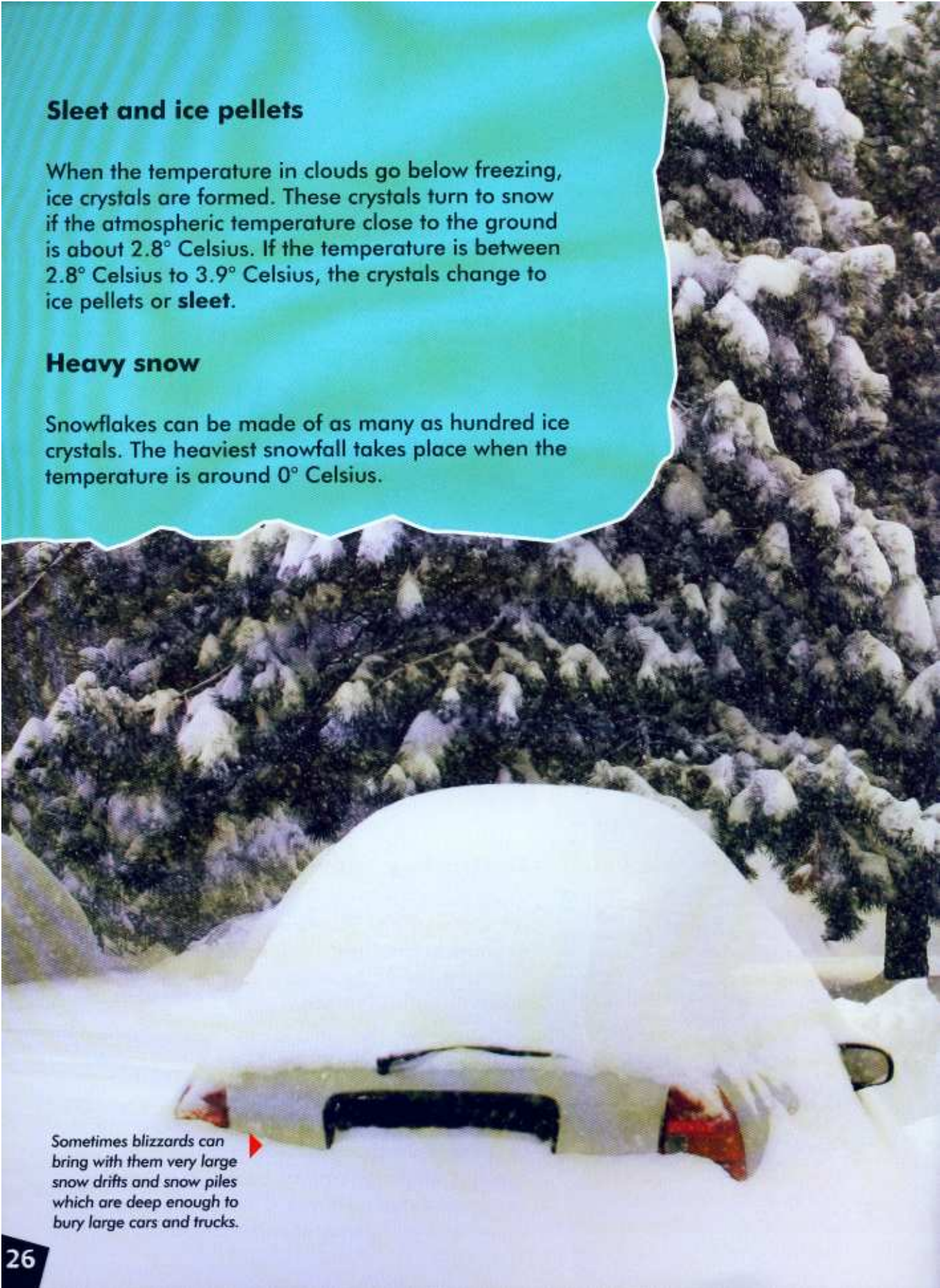


## Sleet and ice pellets

When the temperature in clouds go below freezing, ice crystals are formed. These crystals turn to snow if the atmospheric temperature close to the ground is about  $2.8^{\circ}$  Celsius. If the temperature is between  $2.8^{\circ}$  Celsius to  $3.9^{\circ}$  Celsius, the crystals change to ice pellets or **sleet**.

## Heavy snow

Snowflakes can be made of as many as hundred ice crystals. The heaviest snowfall takes place when the temperature is around  $0^{\circ}$  Celsius.



Sometimes blizzards can bring with them very large snow drifts and snow piles which are deep enough to bury large cars and trucks.





## Damaging ice storms

Ice storms and blizzards are two common forms of winter storm. Ice storms mostly occur when the temperature is just below freezing point. In such storms, the rain from the clouds freezes as it hits the ground. This makes a coating of ice on roads, leading to driving accidents.

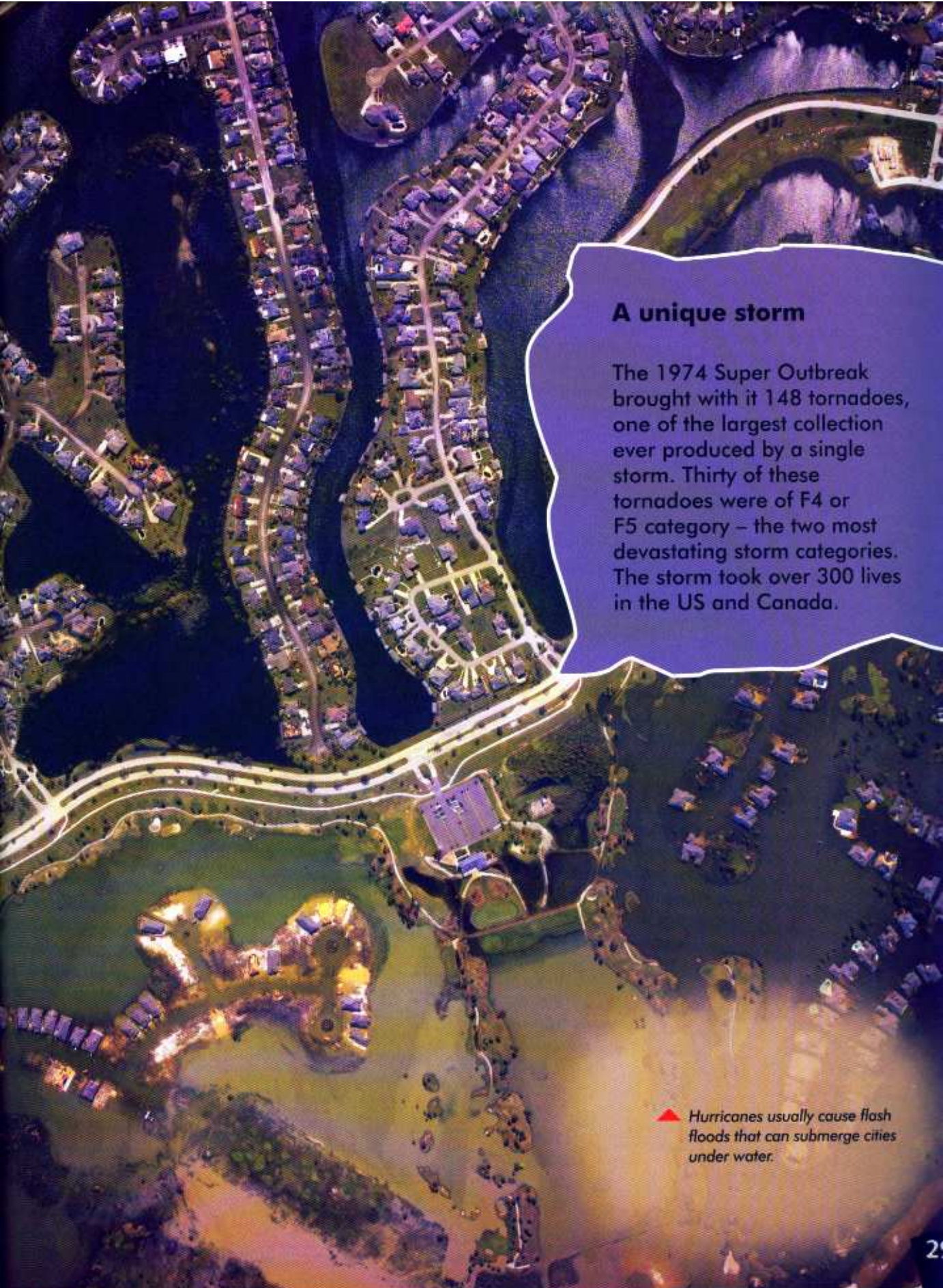
## Hail

Hail is another form of precipitation. Hail is formed when strong air currents carry ice crystals between a thundercloud's top and bottom layers. The crystals gain in size till they fall down on land as hail.

The sizes of hailstones can range from very small to very large. A hailstone can even weigh up to 450 grams. Smaller pieces that have diameters of less than five millimetres are called sleet or ice pellets.





An aerial photograph showing a residential area with houses and roads. A large portion of the area is submerged in floodwater, which is a murky brown color. The houses are mostly two-story structures with dark roofs. The roads are visible as light-colored lines winding through the area. A large, irregularly shaped white box with a black border is overlaid on the right side of the image, containing text. In the bottom right corner, there is a small red triangle icon followed by a line of text.

## A unique storm

The 1974 Super Outbreak brought with it 148 tornadoes, one of the largest collection ever produced by a single storm. Thirty of these tornadoes were of F4 or F5 category – the two most devastating storm categories. The storm took over 300 lives in the US and Canada.

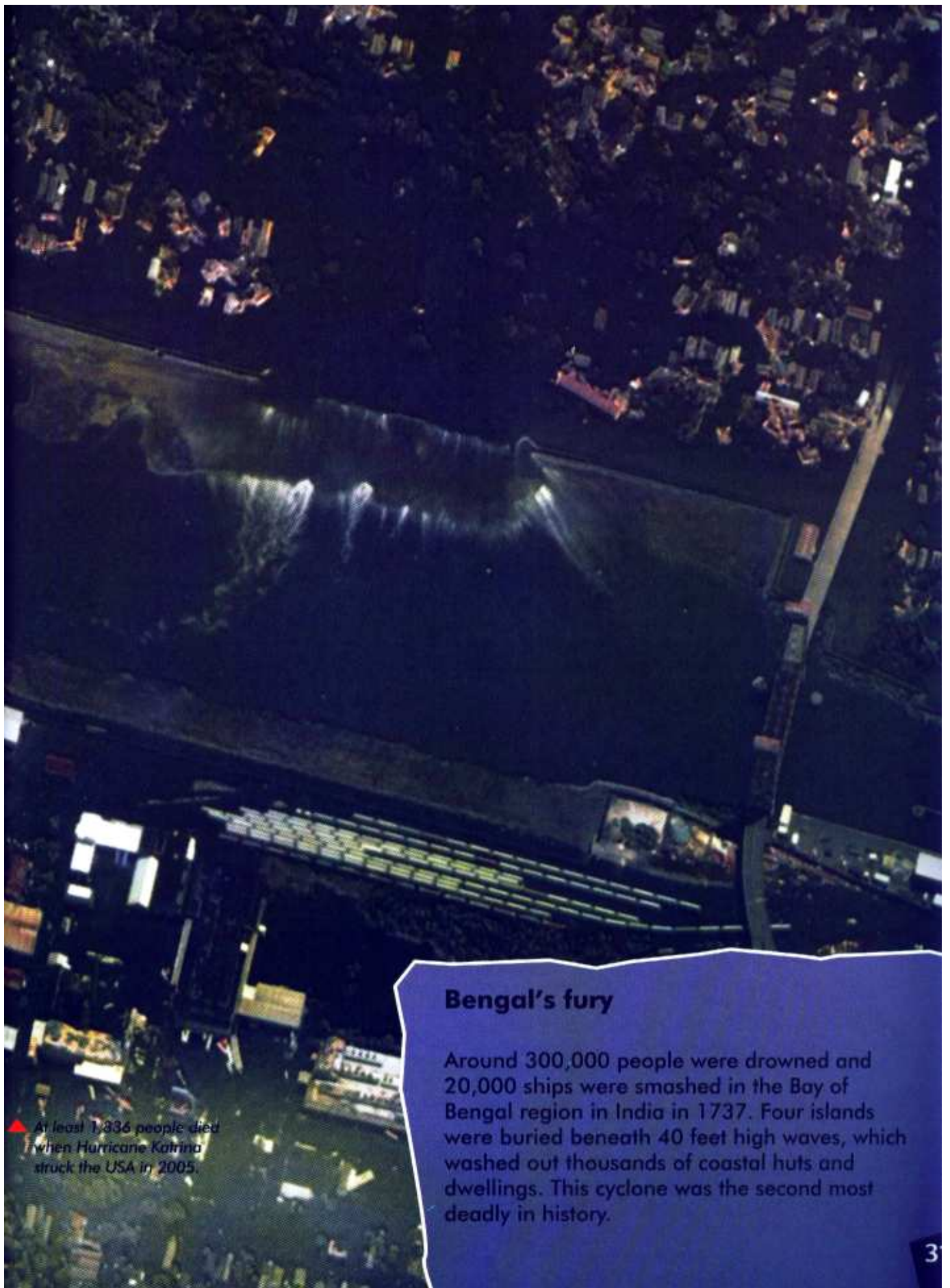
▲ Hurricanes usually cause flash floods that can submerge cities under water.



## Hurricane Ike

On September, 2008, Hurricane Ike hit the southern coast of the United States with wind speeds of up to 230 km/h. The hurricane eventually took 195 lives and totalled \$24 billion of damages – the third costliest in US history.





▲ At least 1,836 people died when Hurricane Katrina struck the USA in 2005.

### Bengal's fury

Around 300,000 people were drowned and 20,000 ships were smashed in the Bay of Bengal region in India in 1737. Four islands were buried beneath 40 feet high waves, which washed out thousands of coastal huts and dwellings. This cyclone was the second most deadly in history.



# Weather And Meteorology

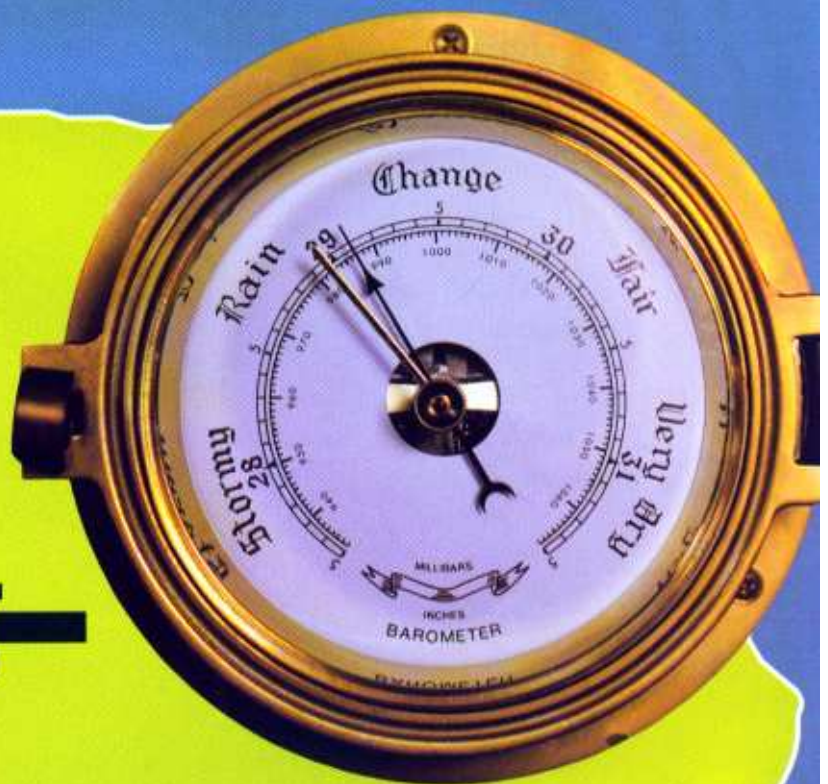
People try to predict weather to prepare in advance for all its extremities. Over 4,000 years ago, people made forecasts based on the position of the stars. Since then, several instruments and technologies have been developed for more accurate predictions. This study of weather is known as meteorology.

## Weather gauging instruments

Thermometers measure temperature; anemometers measure wind speed; and **barometers** measure pressure. There are weather vanes to indicate the direction of wind. **Hygrometers** measure humidity, and rain gauges are used to calculate the amount of rainfall.

## Better methods

The methods became better over time. With the advent of the telegraph, meteorologists were able to send their reports quickly. In the mid 1800s France and Great Britain became the first countries to send telegraphed weather reports.



▲ A barometer is an instrument for measuring atmospheric pressure. It was invented in 1643 by the Italian scientist Evangelista Torricelli.



## Radars

Observation stations use **radars** to pick up signs of imminent storms. It was not always like that. Two hundred years ago, weather reports were sent by mail. By the time the mail reached the intended destination, the storm would already have arrived and caused destruction.

A Radar stands for Radio Detection And Ranging. A weather radar consists of a parabolic dish (it looks like a satellite dish) encased in a protective dome and mounted on a tower of up to five storeys tall.







### Satellite marvels

Weather stations these days have **satellites** in outer space that orbit the Earth to give them the necessary details on the weather. Satellites send pictures of the Earth, which provide the observation station information, including cloud patterns. With the help of these pictures, meteorologists can spot imminent weather dangers, like hurricanes and storms.





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## Polar-orbiting satellite

Meteorologists use two types of major *satellites* – polar-orbiting and geostationary. Polar-orbiting weather satellites hover above the Earth at altitudes between 800 and 1,400 kilometres. One satellite can cover about two percent of the planet's total surface.

## Geostationary satellite

Geostationary satellites orbit the Earth's *equator at heights of nearly* 36,000 kilometres. They cover a much greater area than polar-orbiting satellites. Some geostationary satellites can cover the entire surface area of the Earth.

## Other facilities

There are special aeroplanes meant to help out meteorologists. These weather planes take measurements and give information on atmospheric conditions.

◀ *Metop is Europe's first polar-orbiting satellite. With its sophisticated instruments, this weather satellite can provide data of great accuracy and resolution.*



# Man-Made Weather Problems

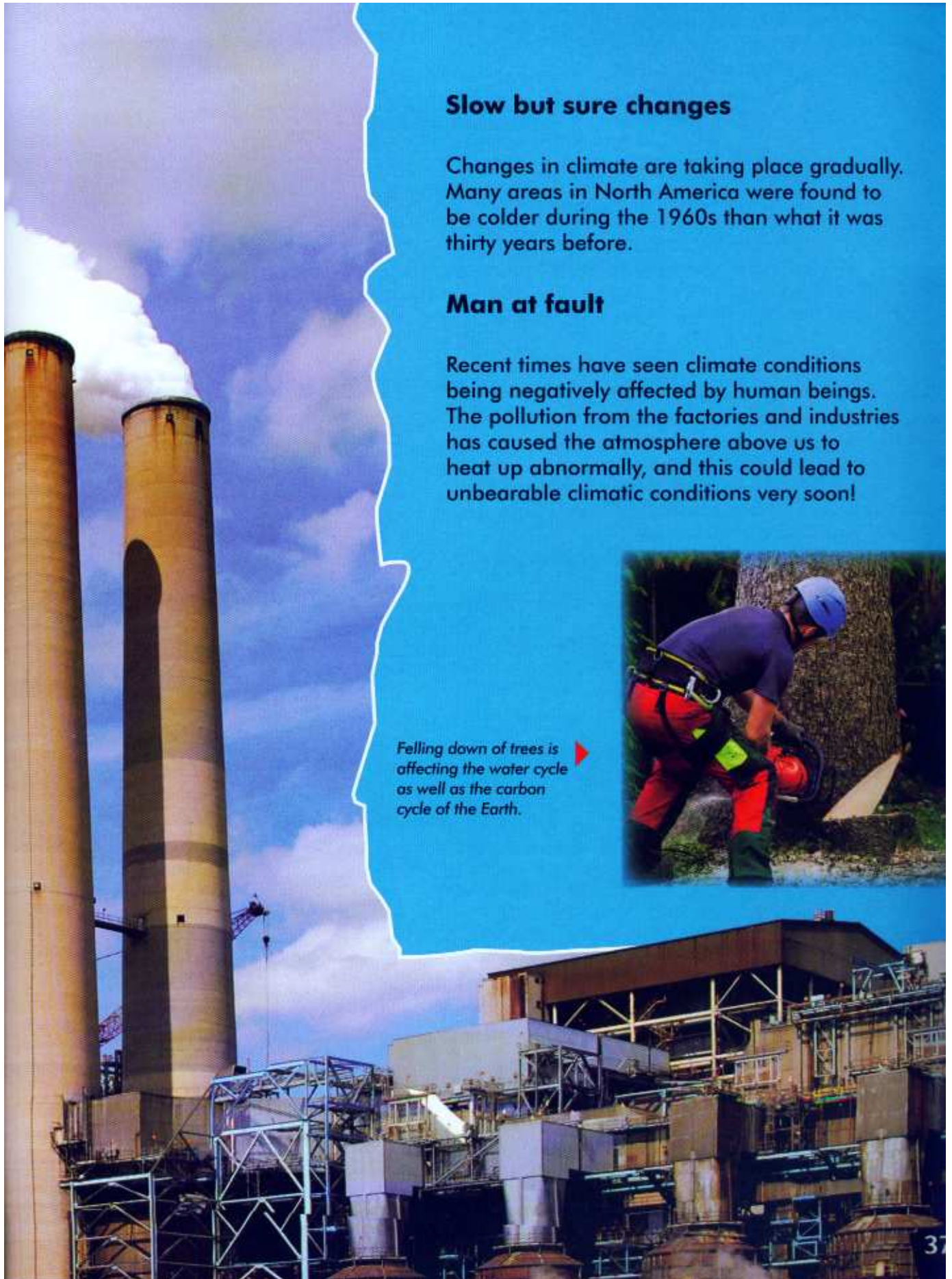
**Weather conditions have changed over the centuries. While the earliest changes were of natural causes, the later ones have been man-made.**

*Fuel emissions from factories are affecting the climate of the Earth negatively.*

## Back to the Ice Age?

Over 50,000 years ago, the Earth's surface was covered in ice. Later, the climate started warming up and the ice gradually melted. The age we now live in is called the Interglacial age. But scientists feel that we may not be too far away from the next **Ice Age**—just 1,000 years away!





## **Slow but sure changes**

Changes in climate are taking place gradually. Many areas in North America were found to be colder during the 1960s than what it was thirty years before.

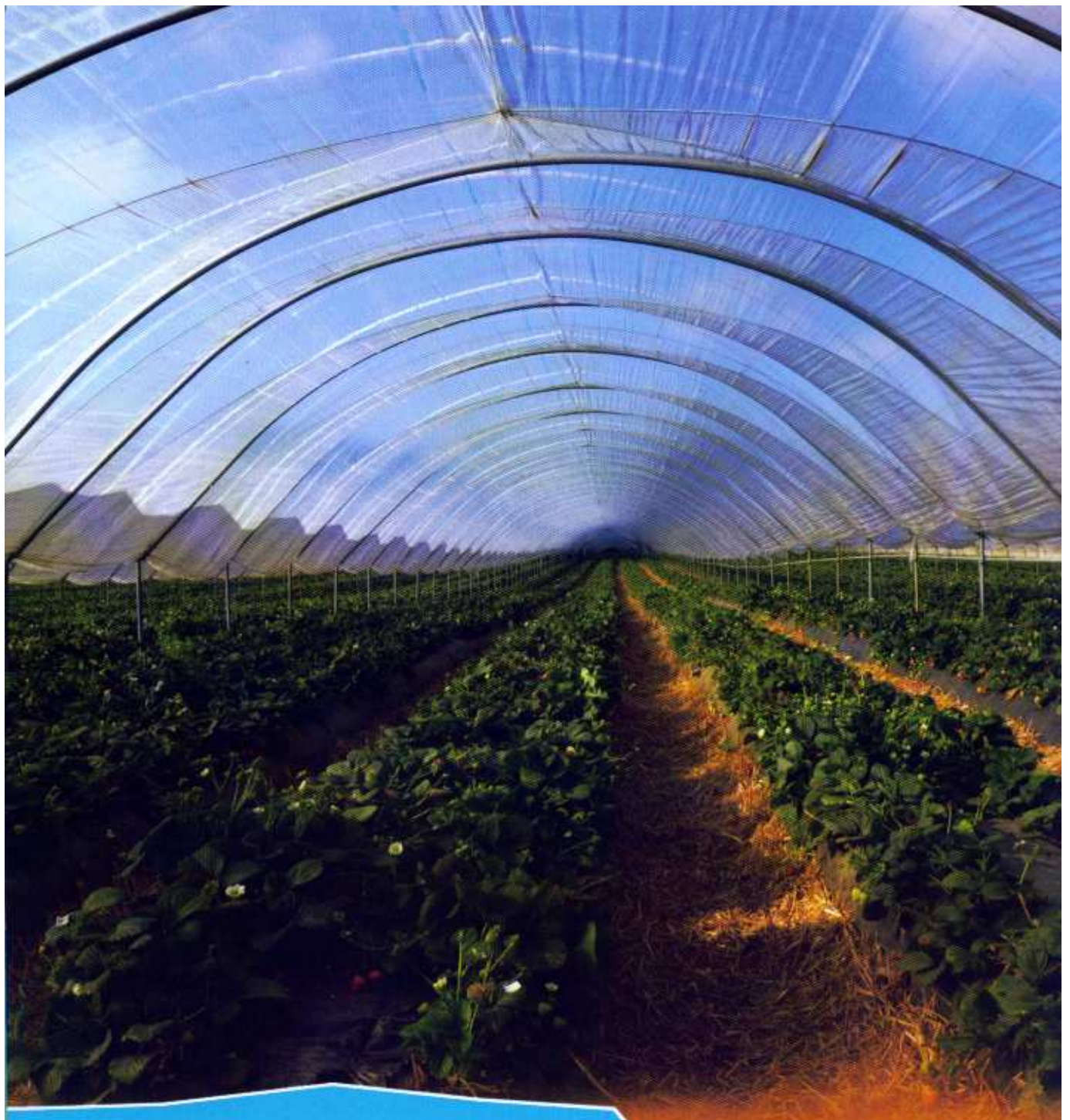
## **Man at fault**

Recent times have seen climate conditions being negatively affected by human beings. The pollution from the factories and industries has caused the atmosphere above us to heat up abnormally, and this could lead to unbearable climatic conditions very soon!

Felling down of trees is affecting the water cycle as well as the carbon cycle of the Earth.





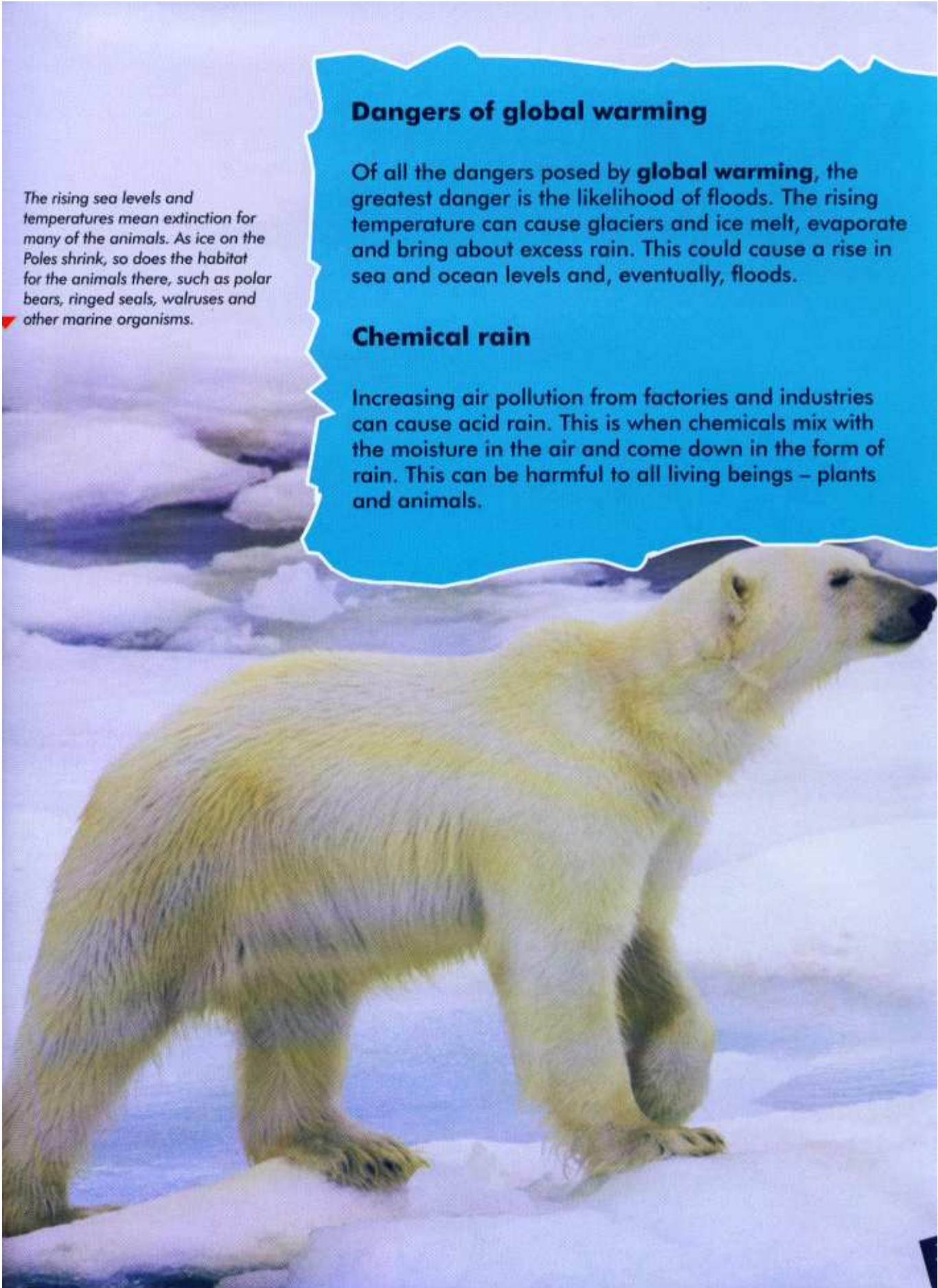


## The Greenhouse effect

Industries are producing excessive greenhouse gases. They burn fossil fuels to generate energy. When fossil fuels burn they produce carbon dioxide, a greenhouse gas. Excessive carbon dioxide and other greenhouse gases in the atmosphere is causing global warming.

▲ A greenhouse keeps plants in it warm. In the same way, carbon dioxide traps the Sun's heat in the atmosphere, and keeps the Earth warm even at night. However, excessive carbon dioxide is harmful.





The rising sea levels and temperatures mean extinction for many of the animals. As ice on the Poles shrink, so does the habitat for the animals there, such as polar bears, ringed seals, walruses and other marine organisms.

## Dangers of global warming

Of all the dangers posed by **global warming**, the greatest danger is the likelihood of floods. The rising temperature can cause glaciers and ice melt, evaporate and bring about excess rain. This could cause a rise in sea and ocean levels and, eventually, floods.

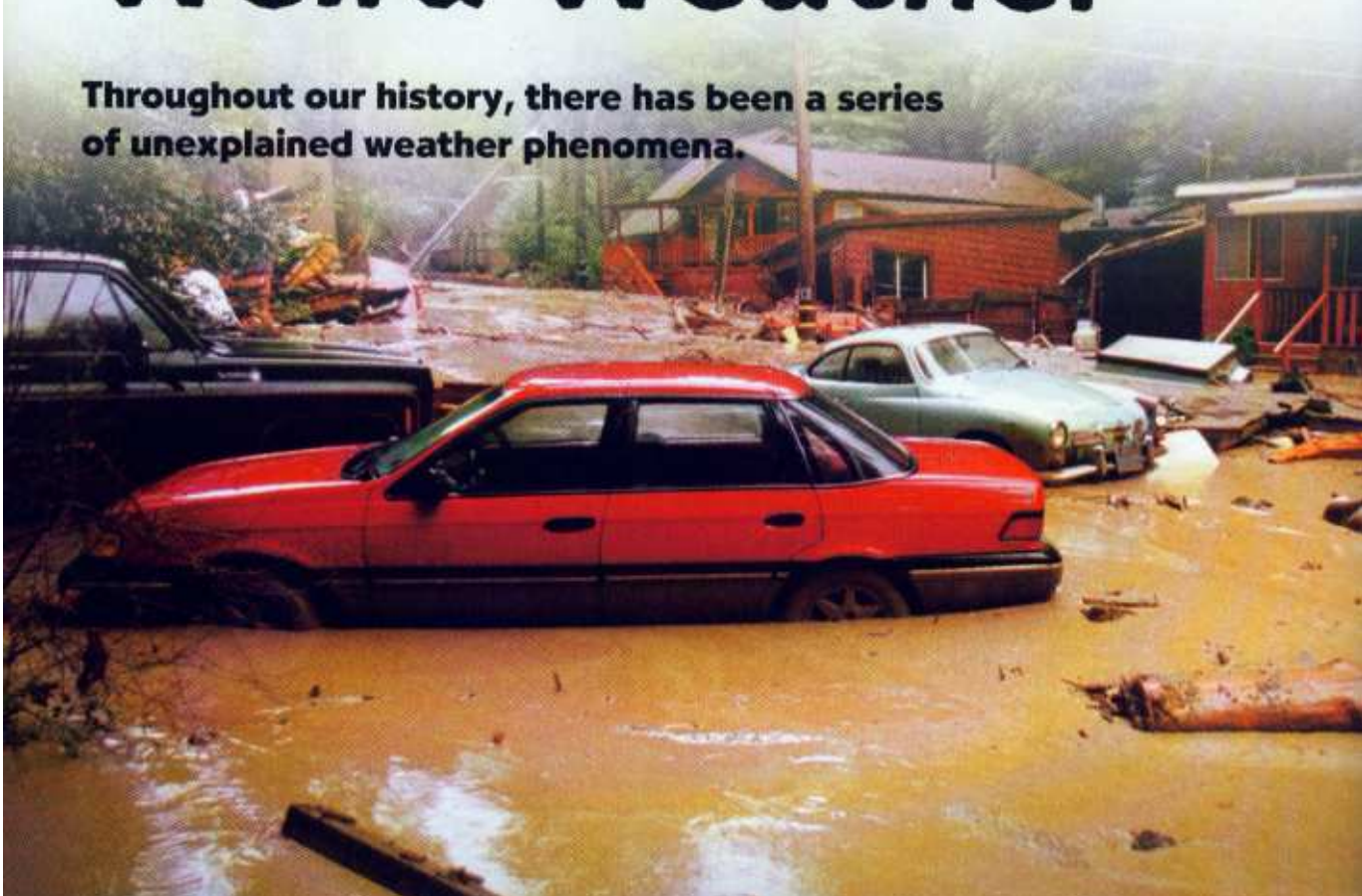
## Chemical rain

Increasing air pollution from factories and industries can cause acid rain. This is when chemicals mix with the moisture in the air and come down in the form of rain. This can be harmful to all living beings – plants and animals.



# Weird Weather

Throughout our history, there has been a series of unexplained weather phenomena.



▲ The unpredictable El Nino has caused severe drought and flood conditions in many parts of the world.

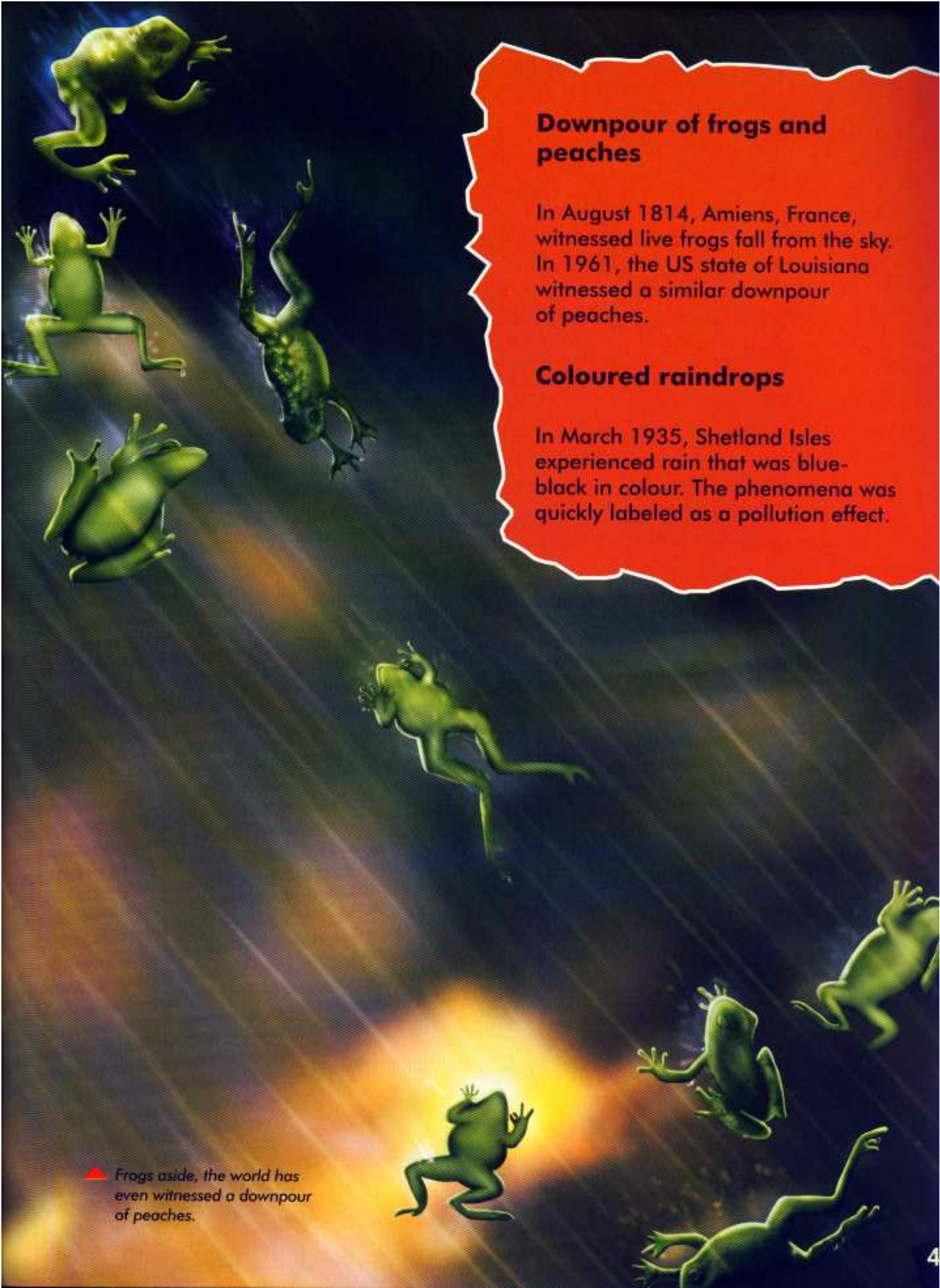
## El Nino

El Nino is the warming of ocean waters in the eastern tropical Pacific. Its cause is yet to be fully explained. The drought conditions in South America and Africa, the 1993 Mississippi floods and the 1998 California floods are all believed to be the handiwork of El Nino.

## Colourful snow

Several parts of the world have received snowfall in brown, green, yellow and red colours. Scientists deemed that the colours were caused by vegetable organisms called *Protococcus Nivalis*.





### Downpour of frogs and peaches

In August 1814, Amiens, France, witnessed live frogs fall from the sky. In 1961, the US state of Louisiana witnessed a similar downpour of peaches.

### Coloured raindrops

In March 1935, Shetland Isles experienced rain that was blue-black in colour. The phenomena was quickly labeled as a pollution effect.

▲ Frogs aside, the world has even witnessed a downpour of peaches.



## **Facts At A Glance**

---

- Only about 10 percent of all thunderstorms are listed as severe. A thunderstorm is classified as severe if it produces hail that is three-quarters of an inch in diameter and carries winds of more than 93 km/hr.
- 1 in 600,000: this is the chance of you being struck by lightning during a thunderstorm.
- About 187 inches of snow fell in a week on Thompson Pass, Alaska, in 1953. The heaviest snowfall recorded in one day is 62 inches, in the same place.
- On September 9, 1994, Glasgow in Scotland recorded a temperature of 19° Celsius at 5:02 a.m. The temperature shot up by 15 degrees in 15 minutes due to a heat burst from a nearby storm.
- The heaviest rainfall ever recorded was 1,825 millimetres at Foc-Foc, la Reunion Island, in the Indian Ocean!
- The storm surge during Hurricane Katrina was 6 metres (20 feet) high.
- The global temperatures have risen by over 0.7° Celsius in the last 300 years. By 2100, global average temperatures may rise by 1.4° Celsius-5.8° Celsius.
- Edmund Halley made the first weather map in 1686.
- Big hailstones can fall at 145 km/hr.







## Test Your Knowledge

Fill in the blanks

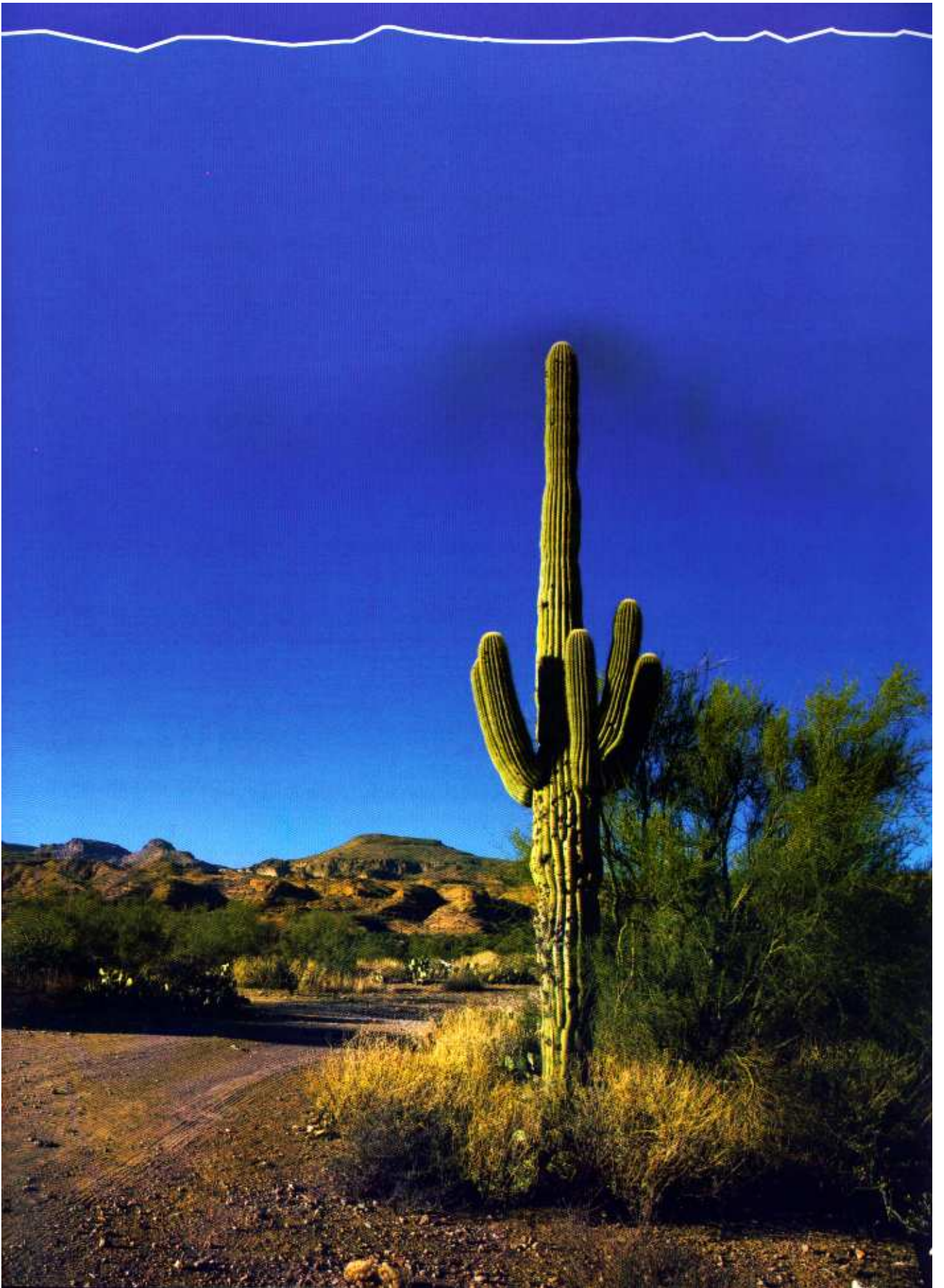
1. \_\_\_\_\_ is the warming of ocean waters in the eastern tropical Pacific.  
a) El Nino b) Tsunami c) Tidal Waves
2. Hurricane Katrina occurred in \_\_\_\_\_.  
a) 2002 b) 2006 c) 2005
3. The hydrologic cycle is commonly known as the \_\_\_\_\_.  
a) Sun cycle b) Water cycle c) Air cycle
4. Wind speed is measured by an instrument called the \_\_\_\_\_.  
a) Hygrometer b) Anemometer c) Barometer
5. \_\_\_\_\_ are destructive and can affect continents at a time.  
a) Cyclones b) Hurricanes c) Thunderstorms
6. Sudden and excessive rainfall can bring about \_\_\_\_\_.  
a) Flash floods b) Tsunami c) Tidal Waves

Match the following:

1	Nimbostratus
2	Hail
3	Geostationary
4	Hygrometer
5	Warm temperate

a	Measures humidity
b	Weather Satellite
c	Rain cloud
d	Big balls of ice
e	A type of climate







## **Glossary**

**anemometer:** instrument that records wind speed and direction

**avalanche:** masses of snow and ice that slide down from a mountain

**barometer:** instrument used to measure atmospheric pressure

**blocking high:** area of high pressure that stays stationary for a long period of time; also called the 'blocking anticyclone'

**drought:** condition in region brought about by an extended period of lack of adequate water

**glacier:** mass of moving ice

**global warming:** an overall increase in world temperatures, which may be caused by additional heat being trapped by greenhouse gases

**Greenhouse effect:** warming that is caused by the trapping of solar radiation in the atmosphere

**humidity:** water in the atmosphere

**hygrometer:** instrument used for measuring the relative humidity of the atmosphere

**Ice Age:** period in world history when glaciers constituted a large part of the Earth's surface

**precipitation:** amount of rain falling on earth at a particular place within a particular period of time

**radar:** instrument used to track future weather conditions

**satellite:** man-made equipment that circles the Earth. It is used for various conditions, including tracking and predicting weather conditions

**sleet:** partly frozen rain

**storm:** violent weather condition with high winds, rains and lightning

**water cycle:** natural cycle of evaporation of water from the seas to precipitation as rain or snow



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# WILD WEATHER

Weather can bring us a lot of happiness as well as grief. Read more about this unpredictable phenomenon in this book. The text and images are informative as well as exciting.

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